



# Seminar Agenda

- Welcome and Introduction
- Operations Modeling Basics
- Operations Model Applications
- Q&A (Panel Discussion)
- Lunch
- Operations Modeling Tools
  - CALSIM II – Erik Reyes
  - HYDROPS – Tung Van Do
  - WQRSS – Carl Chen
  - HEC-RAS – Eric Clyde
- Next Steps



# **Feather River Flow-Stage Modeling (HEC-RAS)**

Eric Clyde, P.E., (MWH)

June 24, 2003

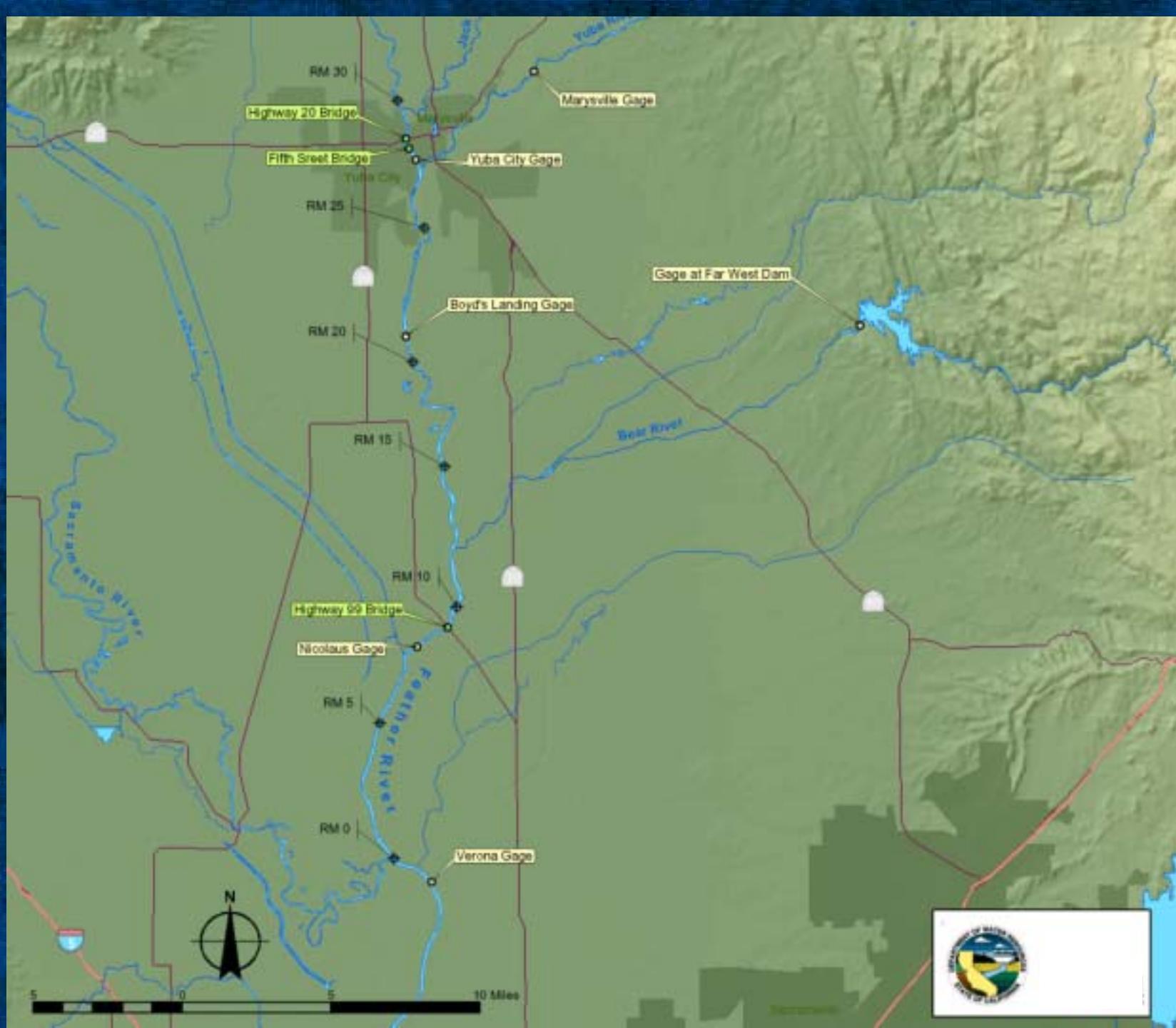


# Information Sources

- U.S. Army Corps of Engineers Sacramento-San Joaquin Basins Comprehensive Study
  - Topographic and hydrographic data collected on Feather River in 1997 and 1998
  - Cross sections cut from topographic data by COE
  - Data developed for flood study
- Flow-stage records at gages along river









# Gages Used for Calibration

<u>Gage Name</u>	<u>CDEC Gage ID</u>	<u>Approximate River Mile</u>	<u>River Basin</u>
Gage at Oroville Dam	ORO	71.5	Feather River
Gridley Gage	GRL	50.64	Feather River
Live Oak Gage	FLO	38.99	Feather River
Yuba City Gage	YUB	27.50	Feather River
Boyd's Landing Gage	FBL	20.75	Feather River
Bear River at Camp Far West Dam	CFW	N/A	Bear River
Marysville Gage	MRY	2.0	Yuba River
Nicolaus Gage	NIC	8.25	Feather River
Verona Gage	VON	79.25	Sacramento River



# Other Information Sources

- As-built drawings
  - inline weirs
  - bridges
- Aerial photos
  - rock diversion dam
  - riffle below Yuba Gage
- Bridge data developed for FEMA study



# Revisions to Model

- Remove tributaries and combine reaches
- Add weirs
  - Thermalito Diversion Dam
  - Fish Barrier Dam
  - Rock Diversion Dam (RM 38.76)
- Add bridge data
- Cross section modifications
  - levee points



# Model Calibration

- Four Calibration runs
  - 2,000 cfs
  - 4,000 cfs
  - 6,000 cfs
  - 10,000 cfs
- Adjusting Manning's n roughness coefficients
- Rock diversion weir at RM 38.76
- Riffle below Yuba City gage
- Modifying channel geometry

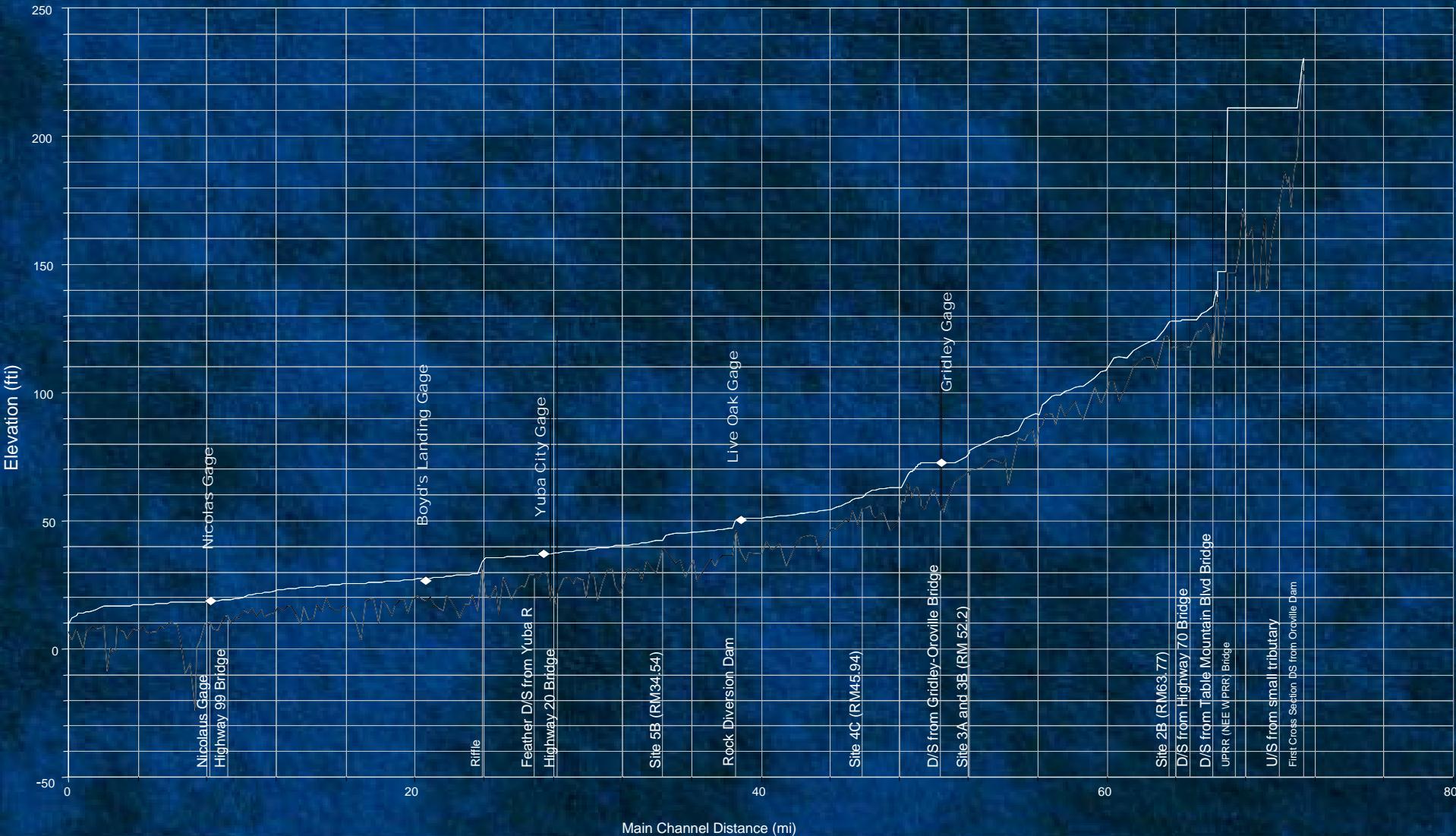


# Calibration Results

Calibration Runs		Gridley Gage RM 50.64	Live Oak Gage RM 38.99	Yuba City Gage RM 27.5	Boyd's Landing Gage RM 20.75	Nicolaus Gage RM 8.25
2000-cfs Run	Model Calculated Stage (feet)	71.02	48.96	35.88	26.31	17.42
	Recorded Stage (feet)	71.36	48.99	35.84	25.86	17.47
	Diff. (feet)	<u>-0.34</u>	<u>-0.03</u>	<u>0.04</u>	<u>0.45</u>	<u>-0.05</u>
4000-cfs Run	Model Calculated Stage (feet)	72.76	50.61	36.95	27.48	18.64
	Recorded Stage (feet)	72.55	50.61	36.95	27.1	18.59
	Diff. (feet)	<u>0.21</u>	<u>0</u>	<u>0</u>	<u>0.38</u>	<u>0.05</u>
6,000-cfs Run	Model Calculated Stage (feet)	73.63	51.85	37.97	29.67	20.94
	Recorded Stage (feet)	73.55	52	38.49	29.1	20.39
	Diff. (feet)	<u>0.08</u>	<u>-0.15</u>	<u>-0.52</u>	<u>0.57</u>	<u>0.55</u>
10,000-cfs Run	Model Calculated Stage (feet)	76.93	56.02	43.24	38.22	33.69
	Recorded Stage (feet)	76.11	55.91	43.57	37.88	34.08
	Diff. (feet)	<u>0.82</u>	<u>0.11</u>	<u>-0.33</u>	<u>0.34</u>	<u>-0.39</u>

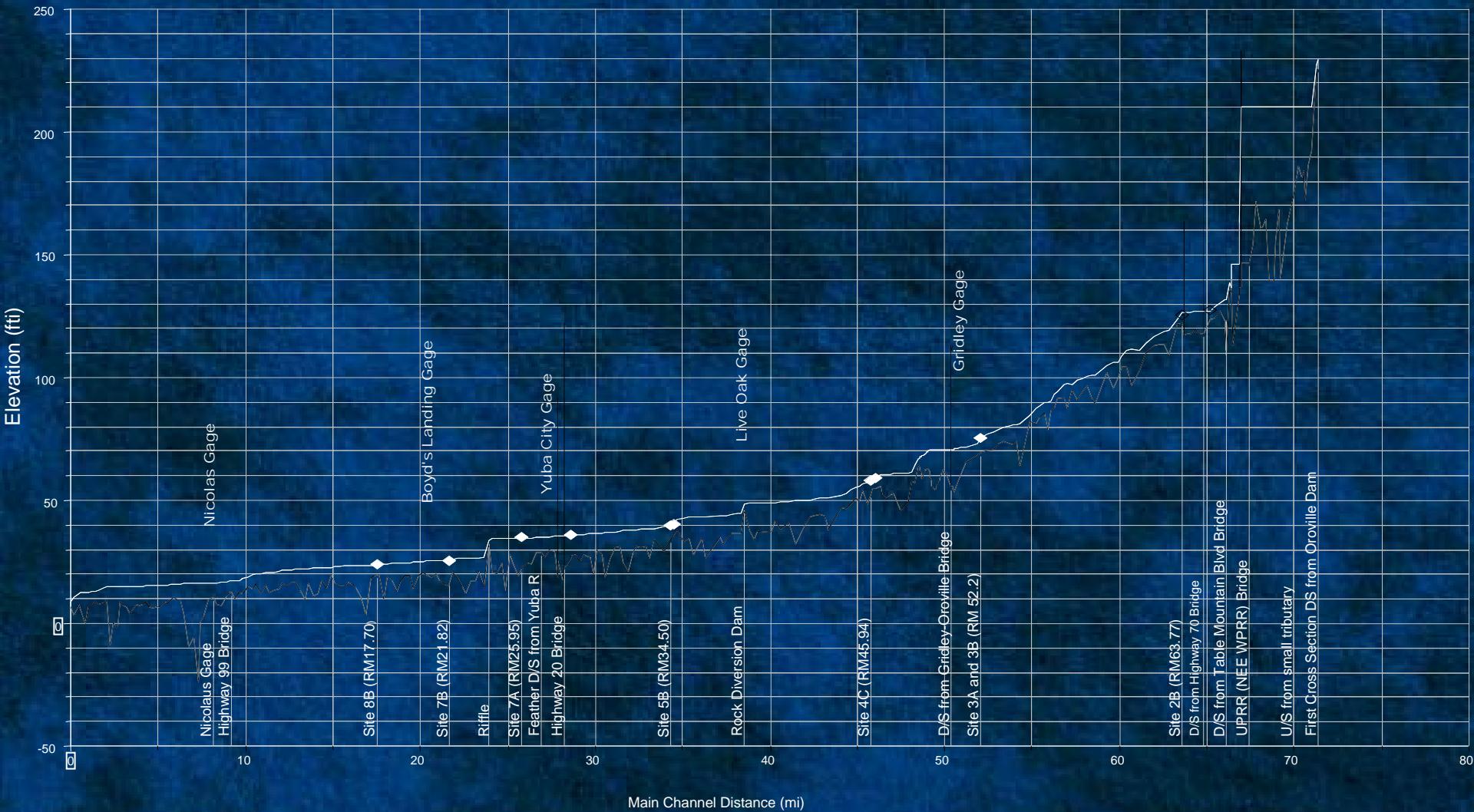


# 2,000-cfs Calibration Run



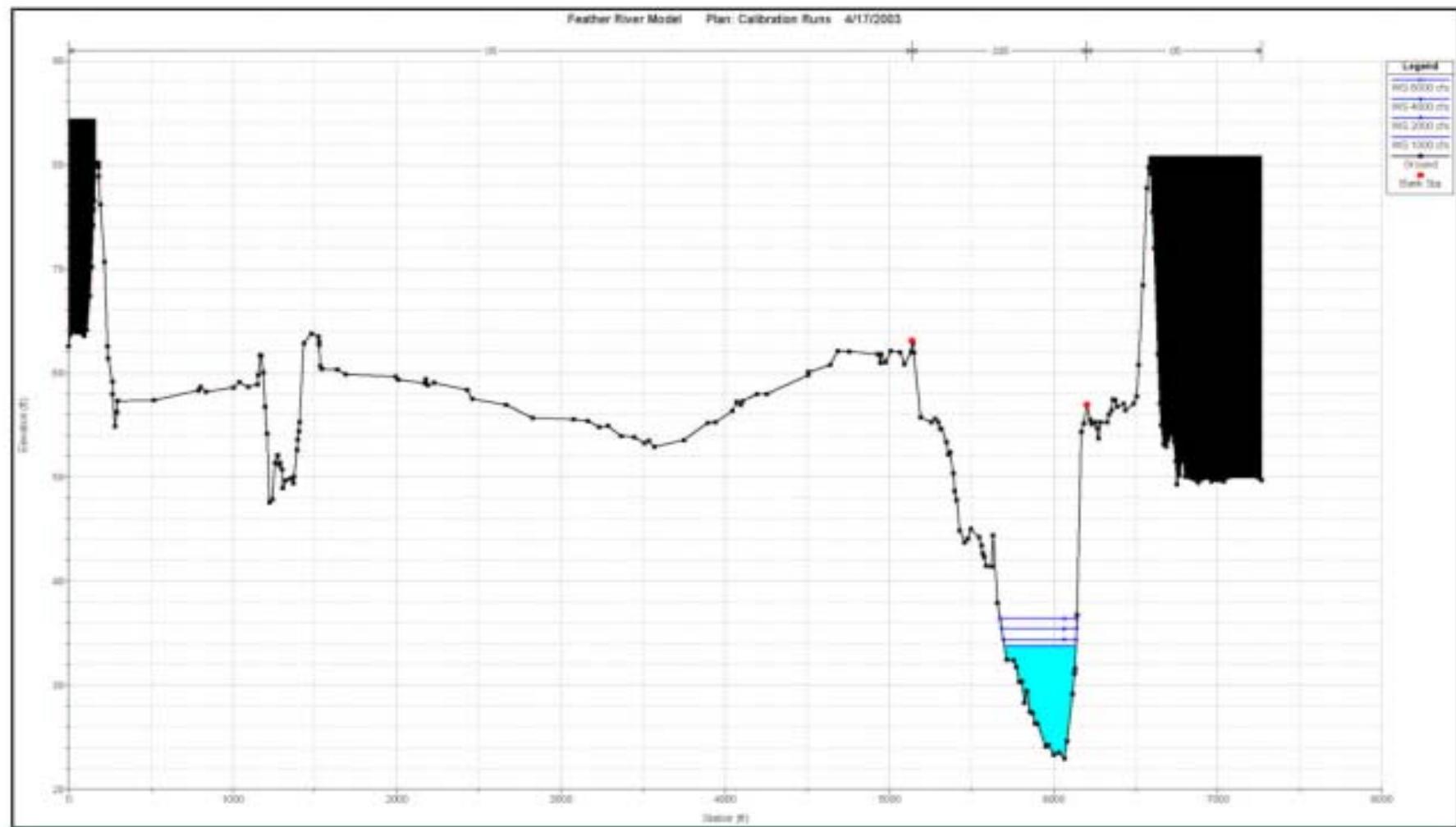


# Validation Run



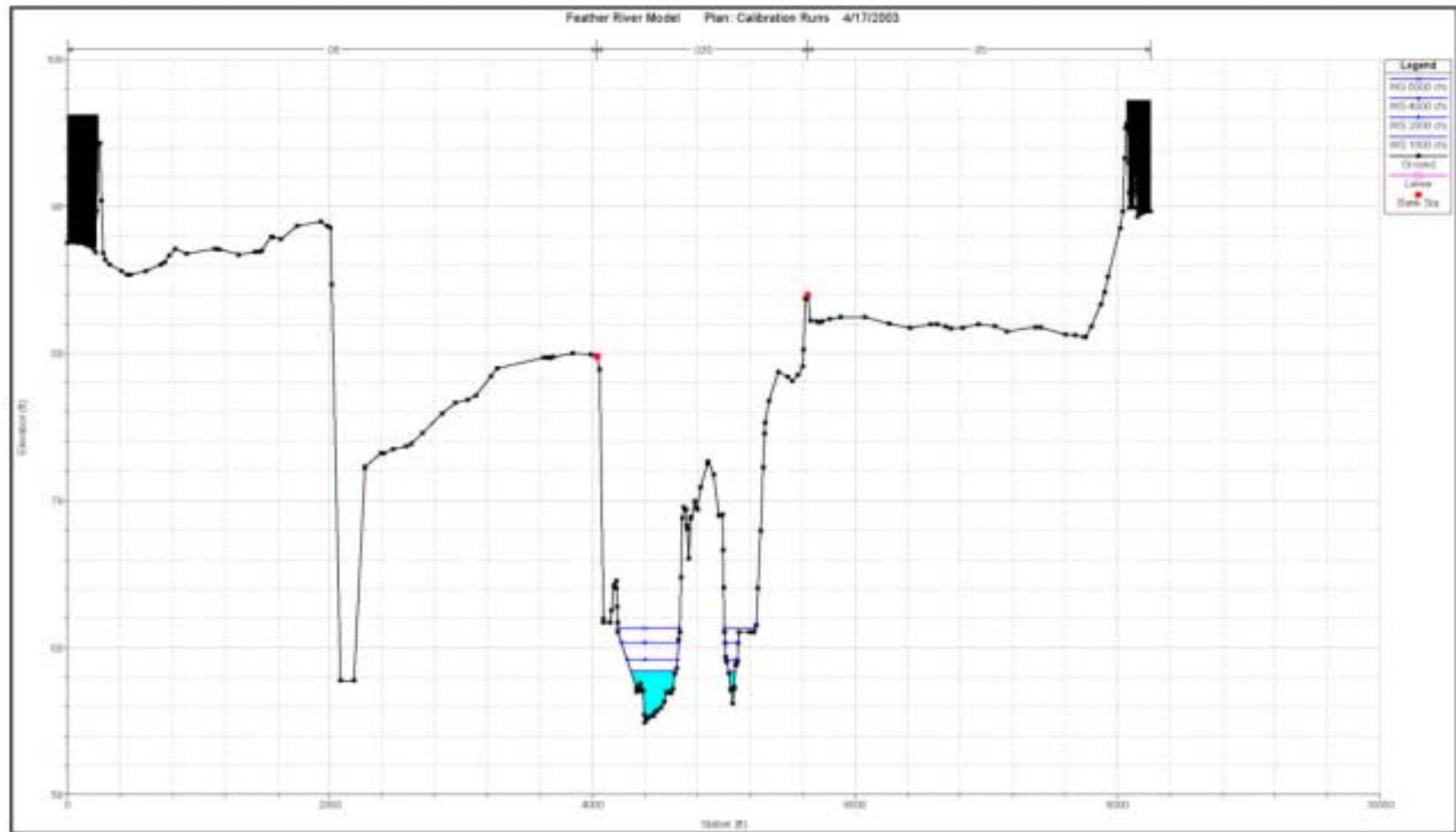


# River Mile 26.00



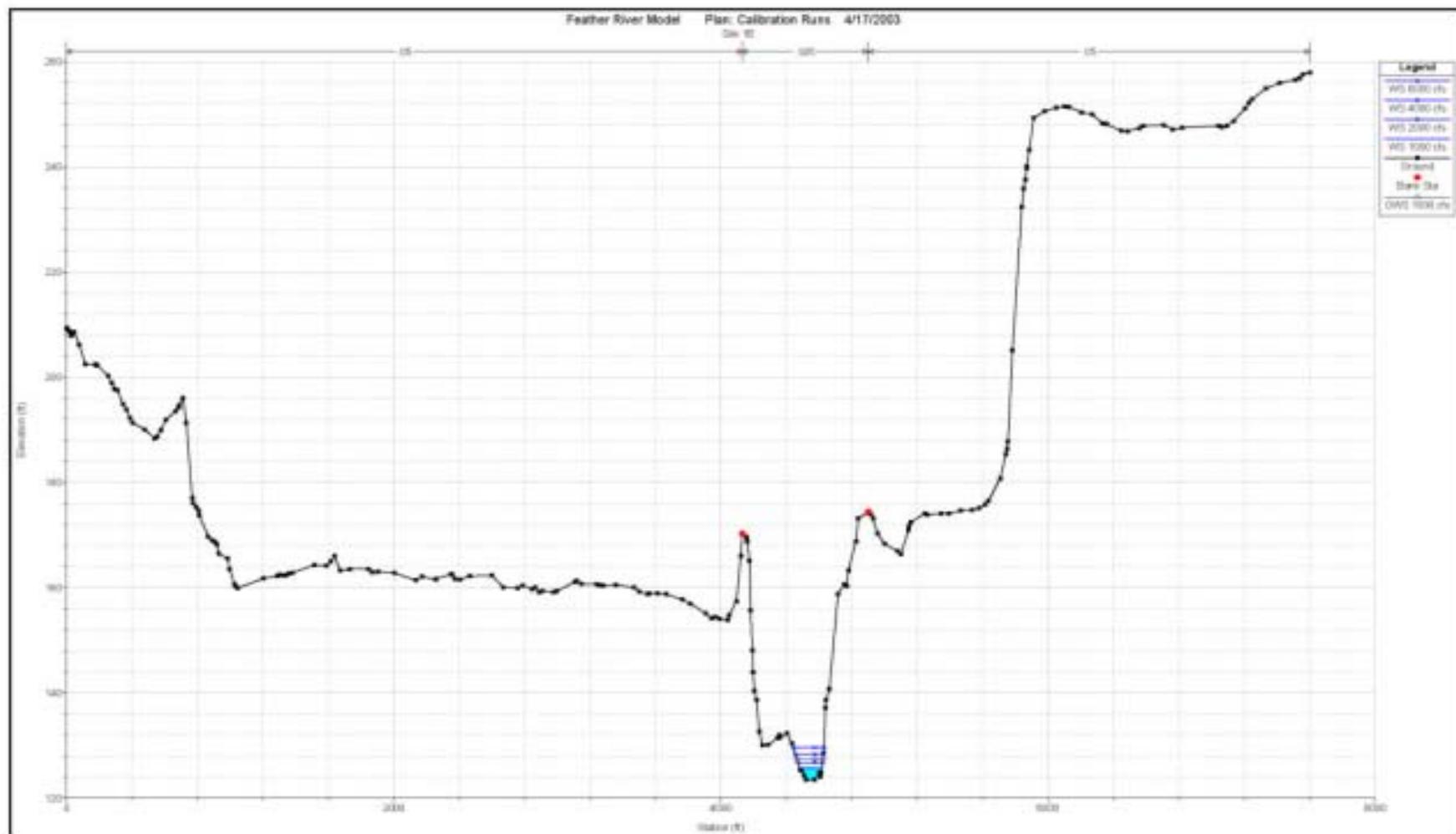


# River Mile 46.25





# River Mile 65.33





# Summary

- Stand-alone flow-stage model for Feather River
- Computed river stages compared well with river gages for 4 flows from 2,000 cfs to 10,000 cfs.
- Model can produce flow-stage rating curves at any location along the river
- Low flows in the upper Feather River (above Gridley gage) may result in stage predictions that vary from actual stages in that reach



# HEC-RAS Q&A





# Seminar Agenda

- Welcome and Introduction
- Operations Modeling Basics
- Operations Model Applications
- Q&A (Panel Discussion)
- Lunch
- Operations Modeling Tools
- Next Steps



# Oroville Facilities Relicensing Operations Modeling Seminar

June 24, 2003